QUALITY IMPROVEMENT

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EFFECT OF AGGLOMERATION PURIFICATION OF QUARTZ POWDERS ON THE QUALITY OF QUARTZ GLASS

R. Sh. Nasyrov,[1, 2] A. S. Lebedev,[1] and R. T. Zainullina[1]

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The effect of agglomeration purification of quartz powders on the quality of quartz glasses obtained using quartz raw materials from the "Berkutinskaya" and No. 175 veins of the Kyshtym deposit is studied. Analysis of the optical transmission spectra and the structural characteristics of the glasses made shows that agglomeration purification of the quartz raw materials is effective for obtaining highly pure concentrates.

Key words: purification, agglomeration, quartz powder, quartz glass, glass structure, optical transmission spectrum.

Specialists are aware of the acuteness of the problem of producing especially pure quartz concentrates. For this reason, work and scientific research on improving the technology of enriching natural quartz raw materials are topical.

The technological operation of enriching quartz sand by thermal agglomeration of particles of mineral inclusions with quartz grains followed by removal of the agglomerations by sieving from the powder is described in the patent claim No. 2008150869/03(066831). This is accomplished by any form of heating of a container holding quartz power to temperature 1350 ± 10°C for the time required to heat the entire volume of the powder. Since the melting temperature of most mineral inclusions in quartz powder is lower than that indicated in the handbook [1], they melt and when in contact with quartz form low-melting glasses. Having melted with quartz grains, the impurity inclusions form agglomerates larger than the largest metric fraction of the powder and can be removed from the powder by sieving. Refractory inclusions in contact with quartz sand can form lower-melting eutectic melts likewise with formation of agglomerates [2]. Depending on the chemical composition of the chemical inclusions the agglomerates can be transparent or colored (Fig. 1). The relative amount and form of the agglomerates are correlated with the amount of mineral impurities and are different for different fractions of the same batch of powder.

The present paper presents the results of the effect of such an operation on the quality of quartz concentrate. The quality of the quartz glasses made from the commercial concentrates prepared from the "Berkutinskaya" and No. 175 veins of the Kyshtym deposit as well as concentrates obtained by thermal agglomeration of quartz from the same veins is used as the test criterion. The glasses were made using the apparatus and technology described in [3].

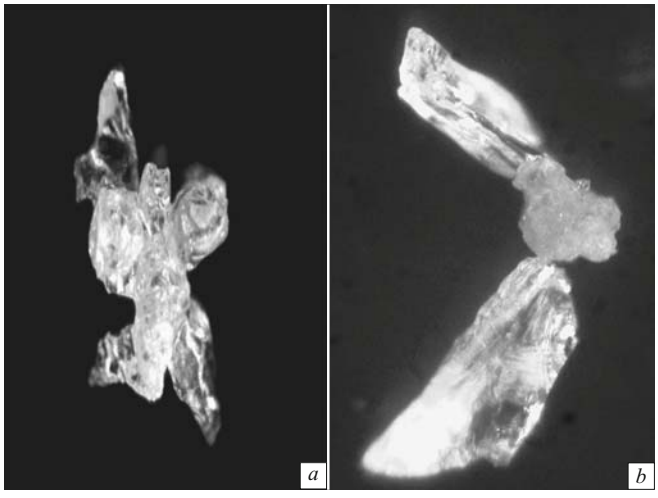

Fig. 1. Photograph of typical agglomerates: *a*) transparent agglomerate formed by melting microcline with quartz sand grains; *b*) colored agglomerate consisting of sphene and quartz sand grains.

[1] Institute of Mineralogy of the Ural Branch of the Russian Academy of Sciences, Miass, Chelyabinsk Oblast', Russia.
[2] E-mail: roudolf@ilmeny.ac.ru.

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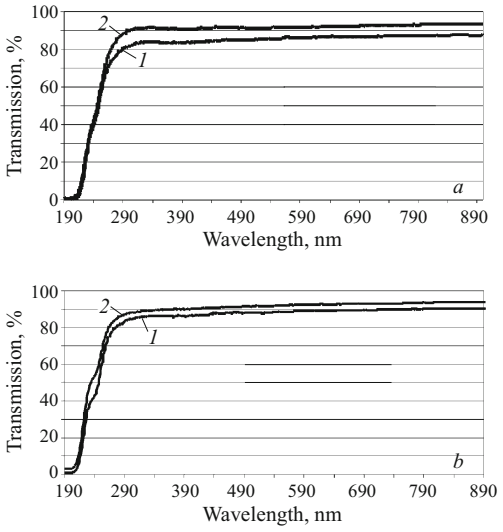

Fig. 2. Optical transmission spectrum of quartz glasses made from commercial concentrates (*1*) and concentrates obtained by agglomeration purification (*2*) based on the quartz veins "Berkutinskaya" (*a*) and No. 175 (*b*) of the Kyshtym deposit.

Figure 2 shows the optical transmission spectra of the glasses made from commercial quartz deep-enrichment concentrate (DEC) prepared from raw materials obtained from the "Berkutinskaya" and No. 175 veins of the Kyshtym deposit as well as concentrate obtained using the same raw material purified by means of thermal agglomeration.

The spectra were obtained with an SF-56 spectrophotometer in the wavelength range 190 – 900 nm by the method of [4]. Analysis of the spectra shows that the agglomeration purification of the quartz sand improves light transmission appreciably. The investigation of the structure in the volume of the quartz glasses showed that the additional agglomeration purification makes it possible to decrease the number of striae and bubbles in the glass and therefore increase the quality of the quartz concentrate.

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